

Software Engineering Methodology

Chapter 8.0 **Software Integration and Testing Stage**

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Stage: **8.0**
Software Integration and Testing Stage

Description: Software integration and testing activities focus on interfaces between and among components of the software product, such as functional correctness, system stability, overall system operability, system security, and system performance requirements (e.g., reliability, maintainability, and availability). Software integration and testing performed incrementally provides feedback on quality, errors, and design weaknesses early in the integration process.

In this stage, software components are integrated and tested to determine whether the software product meets predetermined functionality, performance, quality, interface, and security requirements. Once the software product is fully integrated, system testing is conducted to validate that the software product will operate in its intended environment, satisfies all user requirements, and is supported with complete and accurate operating documentation.

Input: The following items provide input to this stage.

- Project File
- Acceptance Test Plan (*draft*)
- Acquisition Plan
- Installation Plan (*draft*)
- Software modules
- Requirements Traceability Matrix (*expanded*)
- Project Test File
- Development baselines
- Transition Plan
- Operating Documentation (*draft*)
 - Users Manual
 - Programmers Reference Manual
- Training Plan (*draft*)
- Integration Test Plan
- System Test Plan
- Project Plan
- Software Quality Assurance Plan

High-Level
Activities:

The remainder of this chapter is divided into sections that describe specific high-level activities performed during this stage. These activities represent the minimum requirements for a large software engineering effort. *Notes* are provided, as applicable, to assist in customizing these lifecycle stage

**High-Level
Activities,
continued:**

requirements to accommodate the different sizes of software engineering efforts. The high-level activities are presented in the sections listed below.

- 8.1 Conduct Integration Testing
- 8.2 Conduct System Testing
- 8.3 Initiate Acceptance Process
- 8.4 Conduct Acceptance Test Team Training
- 8.5 Develop Maintenance Plan
- 8.6 Revise Project Plan
- 8.7 Conduct Structured Walkthroughs
- 8.8 Conduct In-Stage Assessment
- 8.9 Conduct Software Integration and Testing Stage Exit

Output:

Several work products are produced during this stage. The work products listed below are the minimum requirements for a large software project. Deviations in the content and delivery of these work products are determined by the size and complexity of the project. Explanations of the work products are provided under the applicable activities described in the remainder of this chapter.

- Integration Test Reports
- System Test Report
- Operating Documents (*final*)
 - Users Manual
 - Programmers Reference Manual
- Training Plan (*final*)
- Installation Plan (*final*)
- Acceptance Test Plan (*final*)
- Preacceptance Checklist
- Security Checklist
- Error Reporting and Tracking System (*optional*)
- Requirements Traceability Matrix (*final*)
- Maintenance Plan (*draft*)
- Project Plan (*revised*)

A matrix showing the work products associated with each high-level activity is provided in *Exhibit 8.0-1, Software Integration and Testing Stage Activities and Work Products by Project Size*. The matrix also shows which work products are deliverables and whether they are required or optional for small, medium, and large projects.

Review Process: Quality reviews are necessary during this stage to validate the product and associated work products. The activities that are appropriate for quality reviews are identified in this chapter and the Lifecycle Model chapter. The time and resources needed to conduct the quality reviews should be reflected in the project resources, schedule, and work breakdown structure.

References: Lifecycle Model Chapter, *Quality Reviews*, provides an overview of the Quality Reviews to be conducted on a project.

Chapter 10.0, *Software Maintenance*, provides an overview of the software maintenance process.

Appendix C, *Conducting Structured Walkthroughs*, provides a procedure and sample forms that can be used for structured walkthroughs.

Appendix D, *In-Stage Assessment Process Guide*, provides a procedure and sample report form that can be used for in-stage assessments.

Appendix E, *Stage Exit Process Guide*, provides a procedure and sample report form that can be used for stage exits.

Resource: DOE Software Management Program Web site.

Bibliography: The following materials were used in the preparation of the Software Integration and Testing Stage chapter.

1. The Institute of Electrical and Electronics Engineers, Inc., *IEEE Standard for Developing Software Life Cycle Processes*, IEEE Std 1074-1991, New York, 1992.
2. U.S. Department of Commerce, National Institute of Standards and Technology, *Guide to Software Acceptance*, 500-180, Washington, D.C., 1990.
3. U.S. Department of Labor, Directorate of Information Resources Management, *Systems Engineering Concepts and Procedures Manual*, 1988.
4. U.S. Department of Labor, Directorate of Information Resources Management, *Systems Engineering Standards Manual*, 1988.

Exhibit 8.0-1. Software Integration and Testing Stage Activities and Work Products by Project Size

Work Activity		Project Size			Work Product	Deliverables		
		L	M	S		L	M	S
8.1	Conduct Integration Testing	R	R	R	Integration Test Materials Integration Test Report Requirements Traceability Matrix (<i>expanded</i>)	N R R	N R R	N R R
8.2	Conduct System Testing	R	R	R	System Test Materials System Test Report Operating Documents (<i>final</i>) Training Plan (<i>final</i>) Installation Plan (<i>final</i>)	N R R R R	N R R R R	N R R R A
8.3	Initiate Acceptance Process	R	R	R	Acceptance Test Plan (<i>final</i>) Preacceptance Checklist Security Checklist Error Reporting and Tracking System (<i>optional</i>) Requirements Traceability Matrix (<i>final</i>)	R R A O R	R R A O R	R R A O R
8.4	Conduct Acceptance Test Team Training	A	A	A	Training Materials	N	N	N
8.5	Develop Maintenance Plan	R	R	R	Maintenance Plan (<i>draft</i>)	R	R	R
8.6	Revise Project Plan	R	R	R	Project Plan (<i>revised</i>)	R	R	R
8.7	Conduct Structured Walkthroughs	R	R	A	Structured Walkthrough Management Summary Report	N	N	N
8.8	Conduct In-Stage Assessment	R	R	A	ISA Report Form ¹	N	N	N
8.9	Conduct Software Integration and Testing Stage Exit	R	R	A	Stage Exit Meeting Summary	N	N	N

Size: L = Large
M = Medium
S = Small

Minimum Requirements: R = Required
A = As Appropriate
N = Not a Deliverable²

O = Optional work product
¹ = Completed by reviewer

²A deliverable is a work product that is identified in the Project Plan and is formally delivered to the system owner and other project stakeholders for review and approval.